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Georgian Reduplication and a Relational Theory of Distributivity

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0. Introduction

This paper deals with Georgian reduplication from a relational view of distributivity. By distributivity we mean the kind of linguistic phenomenon that is found in sentences like Every girl likes a boy. It is generally assumed that the sentence is ambiguous between the reading where there is a single boy such that every girl likes him, and the reading where for every girl there is a boy that she likes.[1] In the latter reading, there is a distributive relation between every girl and a boy. In other words, the denotation of every girl distributes over the denotation of a boy, so the sentence describes a situation where there can be as many boys as there are girls.

In a series of works on distributivity, David Gil (1982, 1987, 1989) has been reporting some interesting linguistic phenomena found in many natural languages. His works establish distributivity as a linguistic phenomena and show us the diversity of distributivity phenomena throughout world languages. One of his recent works (1987) deals with the morpho-semantic aspects of Georgian Reduplication. In Georgian, some adjectives

and numerals can be reduplicated, and the reduplication brings about distributive interpretation of the phrase that contains it. Consider (1a) and (1b).

(1) a. md^{z}ime čantebi
heavy-abs suitcase-pl-abs
b. **md^{z}ime-md^{z}ime** čantebi
heavy-dist-abs suitcase-pl-abs

According to Gil(1982:10), (1a) "permits two possible states of affairs: one where each and every suitcase is heavy, another where the suitcases, although individually light, add up to a heavy load. However, (1b) "permits only the first state of affairs, and rules out the second one." One of Gil's claims in his paper is that current formal semantics, which is concerned predominantly with one language--English, fails to give any appropriate analysis for Georgian reduplication. Gil proposes that the semantics of Georgian reduplication can be accounted for in terms of a simple rule involving a binary logical relation of distributivity. While we quite agree with Gil's contention that current theories of formal semantics need to take more diverse languages into consideration, we find that Gil's proposal still lacks any clear formalization. Despite his claim that his theory is relational, his paper does not show in any detail how his relational view can be implemented.

In this paper, we are going to show that the distributive

phenomena reported by Gil can be described in an appropriate way if we adopt the analysis of distributivity proposed in Choe (1987). We will propose that reduplicated forms are "anti-quantificational" markers in the sense of Choe. It will be shown that semantic properties of reduplicated forms, as reported in Gil (1987), are predicted by Choe's theory of distributivity. We will first review major points of Choe, and then re-analyze the Georgian data.

1. Theory of distributivity in Choe (1987)

Choe (1987) has proposed a particular view of distributivity to capture some insights on quantifier related phenomena in various natural languages. It was claimed that distributive dependency is a relation between 'Sorting Key' and 'Distributed Share.' Following the suggestion made in Gil (1989), we will, in this paper, call them Key and Share, respectively.

Key and Share can be morphologically marked. For example, English prenominal <u>each</u> is a Key marker, and postnominal or shifted <u>each</u>, or the term <u>apiece</u>, are all Share markers. What those markers do is to make the distributive reading obligatory. If an NP is immediately followed by <u>each</u>, then there should be an antecedent or Key for the NP with respect to distributivity.

Consider the sentences in (2).

(2) a. Each child bought a red hat.

b. The children bought a red hat each.

The two sentences in (2) can be synonymous with each other. Both have a distributive interpretation. Both have the reading where there are a certain number of x's such that if x is a child, x bought a hat. But the element that triggers the distributive reading is different. It is triggered by the subject of the sentence, each child, in (2a), and by the object, a red hat each, in (2b). Notice that we are treating the expression a red hat each in (2b) as a constituent. There is a good evidence that it is. Consider Sentence (3).

(3) One interpreter each was assigned to the visiting diplomats.
(Burzio 1981/1986; Chomsky 1981)

Apparently, in (3), the expression one interpreter each has moved to the subject position by passive transformation, a standard test for constituency. Sentence (3) also allows only the distributive reading. The sentence would be true in a situation where there are as many interpreters as there are visiting diplomats.

The Share marker each in (2b) and (3) designates the receiving end of distributivity, and in a sense have a role opposite to that of the regular quantifiers like prenominal each, and every. That is why Choe (1987) has proposed to call the NP with Share

markers 'anti-quantifiers.' Compare anti-quantifiers with the standard each phrase in (2a)--each child. Their properties are the opposite. Each child in sentence (2a) has to have the wide scope over the object noun phrase a red hat. On the other hand, a red hat each in (2b) has to have scope under the subject NP the children. Choe argued that anti-quantificational particles are found in many natural languages, and they include German je, Polish po, Russian po, and Korean -ssik, as well as the above mentioned Share markers in English. So if there is any distributivity marker in the given domain, the distributive reading becomes obligatory. If there isn't, it becomes optional.[2]

There is certain similarity between anti-quantifiers and bound anaphors like himself in that both require an antecedent for proper interpretation. But anti-quantifiers go one step further. They partly characterize the meaning of their antecedent.[3] Plural nouns and plural pronouns are typically interpreted as groups (Gil 1982). But when they are related to an anti-quantifier in the given domain, the same plural nouns or pronouns are interpreted distributively.

Example (4) is from Korean.

(4) Kim (1985)

a. noray-han-kok-ul sonim-motwu-ka pwul-ess-ta
song one CL ACC guest all NOM sing PST
'The guests all sang a (single) song.'

b. noray-han-kok-**ssik**-ul sonim-motwu-ka pwul-ess-ta
song one CL ACC guest all NOM sing PST
'The guests each sang a song.'

Kim (1985) claims that (4a) has only the group interpretation, meaning that the guest as a group sang a single song. But if we make the accusative marked NP an anti-quantifier, then the distributive reading is obligatory. (4b) only has the distributive interpretation. So even in a context where the distributive dependency is blocked by some structural constraint,[4] as in (4a), the distributive dependency becomes an obligatory one when an anti-quantificational particle is added to it.

Choe (1987) also claims that hierarchical structure does not play any essential role in distributivity. The above examples have already shown that distributivity is less sensitive to the configuration than bound anaphora is. Reflexive pronoun in English can never appear in the subject position, even in a passive construction, but (3) shows that Share does appear in the subject position. In (4b) Share also appear in a position that is apparently higher in structure than its corresponding Key. Choe proposed that distributivity is to be stated on argument structure, on arguments accessible to each other. One sufficient condition for the accessibility was co-argumenthood. Following Davidson (1980), an event argument was included in the argument structure, and the event argument will be relevant at our later

discussion.

Now, let us see how the step-by-step derivation is achieved. Consider the following example.

(5) Two examiners marked six scripts. (Kempson & Cormack 1981)

Following Kempson & Cormack (1981), we will assume sentence (5) has three different interpretations. One is the group reading, and the sentence can mean a group of two examiners marked a group of six scripts. Another is a distributive reading, where two examiners marked six scripts per examiner, so a maximum of twelve scripts. The other is also a distributive reading, this time six scripts being distributive over two examiners. The sentence would mean that six scripts in total were marked by two examiners per script. It would mean that there can be as many as twelve men involved in the marking of six scripts.

The three expressions in (6) are meant to represent, in a rather loose way, the three interpretations we have just described.

(6) a. M (E^2, S^6)

b. M (E^2, S^6) & Dstr (E^2, S^6)

c. M (E^2, S^6) & Dstr (S^6, E^2)

(6a) means there is an aggregate of two examiners that is in marking relation to an aggregate of six scripts. If we borrow a

term "a plural individual" from Link (1985), (6a) means a plural individual that is composed of two examiners has a marking relation to another plural individual that is composed of six scripts. (6b) means the same except that it has an added meaning of distributivity holding from a plural individual of two examiners to that of six scripts. (6c) is just like (6b) except that the Key and the Share of the distributivity relation is the other way around. What (6b) and (6c) claim is that we separate distributivity from the rest of the meaning of the sentence. Our next question is what we do with the separate distributive meaning. Our answer is given in (7) to (8).

(7) $\forall_{a*A} \exists B$ $\quad$ $\underline{a*A}$:= $\underline{a}$ is an i-part of $\underline{A}$

(8) (cf. (6))

a. $M(E^2, S^6)$ ==> a'. $\exists E^2 \exists S^6 M(E^2, S^6)$

b. $\forall_{e*E2} \exists S^6 (M(e, S^6))$ ==> b'. $\exists E^2 \forall_{e*E2} \exists S^6 (M(e, S^6))$

c. $\forall_{s*S6} \exists E^2 (M(E^2, s))$ ==> c'. $\exists S^6 \forall_{s*S6} \exists E^2 (M(E^2, s))$

The distributive relation Dstr (A, B) triggers the introduction of a quantifier set given in (7). There $\underline{\text{an i-part}}$ means the individual part of the plural individual (Link 1985). Compare (6a, b c) to (8a,b,c) respectively. There is no change from (6a) to (8a), since there is no other aspect of meaning in (6a). On the other hand, (6b) and (6c) are translated into (8b) and (8c)

respectively. In each case, the relevant quantifier set is introduced to the left hand side of the base representation, and we suggest the following algorithms for that purpose.

(9) If a distributivity dependency is marked[5] between A and B

i) Introduce a universal quantifier for a where a is an i-part of A, and replace the variable A with a in the given representation.

ii) Introduce an existential quantifier for B to the right-hand side of the universal quantifier.

But we still have one or two unbounded variables, or variable look-likes, in (8a), (8b), and (8c). For all those unbounded ones, we introduce existential quantifiers, following the idea of existential closure (Heim 1982). The idea is that pragmatic considerations require us to introduce existential quantifiers for all the unbounded variables left at the end of derivation.

Now consider the expression in (8a'). It is a representation of the group reading, and it reads "there is some plural individual E^2 and there is some other plural individual S^6 such that E^2 has the marking relation to S^6." (8b') and (8c') are representations for distributive readings. (8b') reads that "there is some E^2 such that for every e where e is an individual part of E^2 there is some S^6 such that e has a marking relation to S^6." Similarly, (8c') represents the other distributive reading

of the sentence (5). Note that Sentence (5) does not have any Key or Share markers. That is why we could get the optional distributive reading as well as the 'default'[6] group reading.

Suppose we have a Share marker added to, for example, six scripts, so that the sentence becomes Two examiners marked six scripts each, then the distributive reading becomes obligatory to the exclusion of the group reading. In fact, by adding a Share marker to six scripts, we are also constraining the possibility of other distributive interpretations since it then must become a Share requiring its Key in the given domain. So (6b) or (8b') would be the only reading we get when we add a postnominal each to six scripts in (5).

Choe (1987) has also shown that the above analysis can be extended to a more complicated example like (10), where we have three arguments, each of which being a good candidate either for a Key or a Share.

(10) Three fanatics have submitted four articles on the race issue to five dailies. (Kempson & Cormack 1981)

Now, how many reading would there be, and how many readings would our analysis predict there to be? Kempson and Cormack states (10) has 19 readings, but they do not specify what those readings are, neither do they articulate how they can get 19 readings in their analysis.[7] The above analysis, when properly constrained by two conditions on the distributive relations,[8] allows 16

representations out of 64 logically possible combinations of 3 arguments, and thus captures in a systematic way the fine-grained aspects of the meaning of the sentence.

2. Georgian Reduplication

Let us now consider the Georgian data in (11).

(11) a. Orma k`acma sami čanta c`aivo
two-erg man-erg three-abs suitcase-abs carried-3sg

b. Orma k`acma **sam-sami** čanta c`aivo
two-erg man-erg three-dist-abs suitcase-abs carried-3sg

(11a) has roughly the same range of interpretations as the English sentence Two men carried three suitcases. However, sentence (11b) allows only the limited set of interpretations compared to (11a). Notice that (11b) has a reduplicated numeral samsami, which is printed in boldface. (11b) can be interpreted as in (12).

(12) a. Two men carried three suitcases each.
b. Two men carried suitcases three at a time.
c. Two men carried sets of three suitcases.

In fact, Gil gives a much more detailed description of the

meaning range of the sentence (11b), which in given in (13). INTERPRETATION A, B, and C match (12a), (12b), and (12c), respectively.

(13) (Gil 1987: 13)

a. INTERPRETATION A
   -- two men;
   -- men acted individually;
   -- one or many events;
   -- two sets of three suitcases, one for each man; sets either disjoint or not necessarily so;
   -- suitcases acted upon individually or collectively.

b. INTERPRETATION B
   -- two men;
   -- men acted individually or collectively;
   -- many events;
   -- at least two sets of three suitcases, one for each event; sets either disjoint or not necessarily so;
   -- suitcases acted upon preferably collectively.

c. INTERPRETATION C
   -- two men;
   -- men acted individually or collectively;
   -- one or many events;
   -- at least two sets of three suitcases; sets preferably disjoint;
   -- suitcases acted upon preferably collectively.

Gil claims that current semantic theories he knows of cannot handle properly the rich semantic aspects of Georgian reduplication as witnessed in (13).

What we will do in the rest of this paper is, first, to show that our analysis can describe the apparently complicated fine grains of meaning in (10). Secondly, we will show in section 4 that our analysis is well constrained enough to allow the Georgian sentence (11b) only the readings it is supposed to have.

3. Is the theory powerful enough to handle the Georgian data?

To show that Choe's (1987) analysis of distributivity is sufficient enough to deal with the interpretations in (13), we will first convert Gil's description of meaning in (13) into the one that will fit Choe's (1987) analysis. For instance, "two men" in (13a, b, and c) means that two particular men are involved, and thus we convert it into "the argument <u>two men</u> is definite" in our terms, as we can see in (14a). Gil's "men acted individually" would read "<u>two men</u> functions as a Key" in our terms since men's individual acting would entail separate action per man. On the other hand, if there are men that acted collectively, it excludes the possibility that men functions as a Key; either there is a group action or "men" serves as a Share. We can find other conversion as well in (14), which covers all the major features found in (13).

(14) a. "two men": two men is definite.

b. "men acted individually": two men functions as a Key.

c. "men acted collectively": either two men is not involved in a distributive relation, or it functions as a Share.

d. "suitcases acted upon individually": three suitcases functions as a Key.

e. "suitcases acted upon collectively": either three suitcases is not involved in a distributive relation, or it functions as a Share.

In Choe (1987), it was argued that a definite expression cannot become a Share. Since two men is definite according to (14a), it cannot function as a Share. Therefore in (14c) we drop the possibility of collective two men functioning as a Share. Now, given the conversion in (14), we can restate Gil's description of Georgian reduplication (13) as in (15), item by item.

(15)

a. INTERPRETATION A: 3 suitcases per man

1. one event, suitcases acted upon collectively:
   Carried(1 event, 2 men, 3 suitcases) & Dstr(2 men, 3 suitcases)
2. many events, suitcases acted upon individually:
   Carried(1 event, 2 men, 3 suitcases) & Dstr(2 men, 3 suitcases) & Dstr(3 suitcases, 1 event)

3. many events, suitcases acted upon collectively:
   Carried(1 event, 2 men, 3 suitcases) & Dstr(2 men, 3 suitcases) & Dstr(2 men, 1 event)

b. INTERPRETATION B: 3 suitcases per event
   1. men acted individually, suitcases acted upon collectively:
      Carried(x events, 2 men, 3 suitcases) & Dstr(2 men, x events) Dstr (x events, 3 suitcases)
   2. men acted collectively, suitcases acted upon collectively:
      Carried(x events, 2 men, 3 suitcases) & Dstr (x events, 3 suitcases)

c. INTERPRETATION C: union of INTERPRETATION A1
   and INTERPRETATION B1 and B2

INTERPRETATION A in (15), for example, corresponds to that in (13). The situation described by (13a) is reconstructed in our terms as in (15a). In fact, the same situation is subclassified in (15) according to the parameters used in (14). For instance, (15a1) describes a situation where two men each carry three suitcases and where all the carryings are counted as a single event. So it's the event of two men carrying three suitcases each. On the other hand, in (15a2) suitcases are acted upon individually in Gil's terms, or carrying a suitcase count as a single event in our terms.

Note that we are making use of event argument in (15). Event

argument is something that is not realized in syntax, or so we would assume, and it is in the mind of the hearer or the reader to decide what type of event argument there would be in terms of number or in terms of definiteness unless it is constrained by some indirect factors like tense or adverbials in the sentence. Incidentally the number of events is not specified in the given sentence, so a variable x is used. It is assumed that the value of x depends on the context.

4. Is the theory constrained well enough to deal with the Georgian data?

In the following, we will argue that the theory in Choe (1987) predicts only the readings that Gil claims is allowed for the Georgian sentence (11b) that has a reduplicated numeral in it. (16) lists the possible variations in the parameters.

(16) (d:definite; i:indefinite)

a. two men (d), one event (d), three suitcases (i)

b. two men (d), one event (i), three suitcases (i)

c. two men (d), many events (d), three suitcases (i)

d. two men (d), many events (i), three suitcases (i)

Apparently the subject of the sentence is taken as definite according to Gil's interpretations; Notice that in all the three

interpretations in (16), there is no variation in the parameter two men. A Share must be indefinite (cf. Choe 1987) and thus two men cannot be a Share. On the other hand three suitcases is marked to be a Share in any possible interpretation. It can simultaneously function as a Key. These two restrictions are stated in (17):

(17) Restrictions on the possible distributive relations
   a. Two men is taken as a definite expression. (It's in the subject position.)
   b. Three suitcases should serve as a Share.

There is no restriction other than the above two, and if we calculate all the possible combinations of the three arguments with respect to distributivity, they are as in (18).

(18) a. 1) Dstr(2 men, 3 suitcases)----------> A1
b. 1) Dstr(2 men, 3 suitcases)----------> A1
   2) Dstr(2 men, 3 suitcases) & Dstr(2 men, 1 event)--------> A3
   3) Dstr(2 men, 3 suitcases) & Dstr(3 suitcases, 1 event)-> A2
c. 1) Dstr(2 men, 3 suitcases)----------> A1
   2) Dstr(x events, 3 suitcases)----------> B2
d. 1) Dstr(2 men, 3 suitcases)----------> A1
   2) Dstr(2 men, x events) & Dstr(x events, 3 suitcases)----> B1
   3) Dstr(x events, 3 suitcases)----------> B2
   4) Dstr(2 men, 3 suitcases) & Dstr(3 suitcases, x events)-> ?

(18) lists all the possible variations in the parameters. Apparently the subject of the sentence is taken as definite according to Gil's interpretations. A Share must be indefinite and thus two men cannot be a Share. (18a,b,c,d) correspond to (15a,b,c,d), respectively. We have also indicated on the right hand side of each possibility the corresponding interpretation discussed in (15). Notice that (15a1) through (15d3) cover all and only the interpretations that Gil has reported.

The only interpretation that is predicted to exist in our analysis, but is not reported by Gil is (15d4). This would mean that there are two men carrying three suitcases each and carrying each suitcase counts as x number of events, for example, 5 events. How many events would there be? Perhaps 30. It means two men each carrying three suitcases counts as 30 events. It certainly is a possible, but not a plausible situation.[9]

5. Conclusion

The major points of this paper can be summarized as in (19).

(19) a. Semantic effect of Georgian reduplication is distributivity.

b. Georgian reduplication is a marking for Share, that is, it is an anti-quantificational marking that is found in many natural languages.

Our analysis has shown that why the Georgian data have such diverse interpretations as they are claimed to have, and at the same time, why they allow only the readings they have. It also shows that each possible interpretation of can be accounted for on the basis of the interactions of the relevant parameters.

Gil's major claim was that Georgian is different from English and some current theories of semantics based on English are ill-fitted for the apparently complicated Georgian reduplication data. If our analysis in this paper is on the right track, then it proves that there is a theory of distributivity that applies to Georgian as well as English and many other languages. There is no need to assume that we need language-particular semantics because of the apparent difference between Georgian and English, as it seems to be implied by Gil.

Given that anti-quantifiers are found in many natural languages, it is not surprising at all that Georgian does have one. What is rather surprising, though, is that in Georgian it is a reduplicated form of certain morphemes, rather than particular morphemes as was the case in other languages, that marks the (obligatory) distributivity. After all, it shows how diverse natural languages are. Notice that the analysis in Choe (1987) can handle the distributivity found in many natural languages in a uniform way. Then it shows how similar natural languages are with each other despite their apparent differences.

NOTES

1. It should be noted that there is a difference in preference between the two readings, that is, the latter reading is the* preferred one. We ignore the difference in this paper.

2. Morphological marking is not the only trigger for a successful distributivity dependency. Structural, semantic, and/or pragmatic factors might 'conspire' to bring it about. In general, however, where there is not any morphological trigger, the distributive reading is a less preferred one.

3. It would be an interesting issue whether the pronoun also contributes to the characterization of the meaning of its antecedent. In general, it does not, but an apparent exception would be i):

i) Robin called his mother.

In i), Robin could either be a male or a female, and the following pronoun his tells that the object is male.

4. That is, if we accept one of the prevailing assumptions that the subject is structurally higher than the object, and thus the former c-commands the latter, but not vice versa.

5. We assume that there are various kinds of triggers for distributivity, including the morphological markings.

6. 'Default' simply means here "unless specified otherwise."

7. In Choe (1987), the difference between 19 and 16 readings was attributed to the difference in the treatment of the group reading, which is further subclassified in Kempson and Cormack (1981).

8. One of the two conditions is essentially identical to Sampson's (1975) The Single Mother Condition. The other is anti-loop condition. We can find more discussion on this in Choe (1987).

9. We have to stretch extremely our imagination to visualize such a situation, and informants are usually much irritated when they are forced to stretch their imagination to the extreme. Therefore, we would speculate that (15d4) is such an extreme case, probably the most extreme one compared to others in (15), and that was the reason that it was not available. A careful empirical check with the native speakers would help here, which this paper could not conduct.

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